

# **Importation of Cape Gooseberry Fruit, *Physalis peruviana*, from Colombia into the United States**

## **Qualitative, Pathway-Initiated Pest Risk Assessment**

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## A. Introduction

This pest risk assessment was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the importation into the United States of **fresh cape gooseberry fruits (*Physalis peruviana*) grown in Colombia**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low rather than numerical terms such as probabilities or frequencies.

International plant protection organizations, *e.g.*, North American Plant Protection Organization (NAPPO), International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO), provide guidance for conducting pest risk analyses. The methods used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO, IPPC and FAO. The biological and phytosanitary terms, *e.g.*, introduction, quarantine pest, used in this document conforms with the *NAPPO Compendium of Phytosanitary Terms* (Hopper, 1996) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1996).

Pest risk assessment is one component of an overall pest risk analysis. The *Guidelines for Pest Risk Analysis* provided by FAO, 1996 describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

The Food and Agriculture Organization (FAO, 1996) defines "pest risk assessment" as "Determination of whether a pest is a quarantine pest and evaluation of its introduction potential". "Quarantine pest" is defined as "A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled" (FAO, 1996; Hopper, 1996). Thus, pest risk assessments should consider both the likelihood and consequences of introduction of quarantine pests. Both issues are addressed in this qualitative pest risk assessment.

The assessment methods or the criteria used to rate the various risk elements are not described in detail. The details of methodology and rating criteria can be found in *Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, Version 4.0* (USDA, 1995); available from the individual named in the proposed regulations.

## B. Risk Assessment

### 1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; the assessment is in response to a request for USDA authorization to allow importation of a particular commodity. In this case, the importation of **fresh cape gooseberry fruits (*Physalis peruviana*) grown in Colombia** is a potential pathway for introduction of plant pests. Regulatory authority for the importation of fruits and vegetables from foreign sources into the United States is found in 7 CFR §319.56 .

*Physalis* is a member of the Solanaceae family and consists of low herbs of warm and temperate climates. A few are grown for the edible fruits and also for the ornamental fruiting calyx of some species. *Physalis peruviana* grows well in the tropics. (Bailey, 1949).

## 2. Assessment of Weediness Potential of Cape Gooseberry, *Physalis peruviana*

The weediness screening for *Physalis peruviana* is presented in Table 1. These findings did not require a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity	
<b>Commodity:</b> <i>Physalis peruviana</i> L., cape gooseberry (Solanaceae). Native to tropical South America.	
<b>Phase 1:</b>	<i>Physalis peruviana</i> L. is occasionally cultivated in the United States. California, New Jersey, Hawaii, Kentucky and Massachusetts are listed in the PLANTS database under distribution for this species.
<b>Phase 2:</b>	Is the species listed in:
<u>YES</u>	<i>Geographical Atlas of World Weeds</i> (Holm, 1979)
<u>NO</u>	<i>World's Worst Weeds</i> (Holm, 1977)
<u>NO</u>	<i>Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act</i> (Gunn and Ritchie, 1982)
<u>NO</u>	<i>Economically Important Foreign Weeds</i> (Reed, 1977)
<u>NO</u>	Weed Science Society of America list (WSSA, 1989)
<u>YES</u>	Is there any literature reference indicating weediness (e.g., <i>AGRICOLA</i> , <i>CAB</i> , <i>Biological Abstracts</i> , <i>AGRIS</i> ; search on "species name" combined with "weed").
<b>Phase 3: Conclusion:</b>	
<i>Physalis peruviana</i> L. is listed in the <i>Geographical Atlas of World Weeds</i> as a common weed in Hawaii, Indonesia, Kenya, Rhodesia and a weed of unknown importance in Australia, Fiji, India, New Zealand, Peru, West Polynesia, and the United States. Because <i>Physalis peruviana</i> is grown without restriction in at least five states and is not officially controlled, it is not a candidate for the Federal noxious weed list.	

### 3. Previous Risk Assessments, Current Status and Pest Interceptions

#### 3a. Decision history for *Physalis peruviana*

Colombia 1988 - Entry denied, no acceptable treatment for medfly.

Ecuador 1988 - Entry denied, no acceptable treatment for medfly.

Colombia 1996 - Entry denied, no acceptable treatment for medfly.

#### 3b. Interceptions from *Physalis* spp. from South America - FY 1985-97.

Pyraustinae, species of. *Physalis ixocarpa* (fruit) Colombia

### 4. Pest List: Pests Associated with *Physalis* spp.

The pests, listed for *Physalis* spp. in Table 2, were developed after a review of the information sources listed in USDA (1995). The list summarizes information on the distribution of each pest, pest-commodity association, and regulatory history.

Table 2: Pest List - <i>Physalis</i> spp.			
Scientific Name, Classification	Distribution <sup>1</sup>	Comments <sup>2</sup>	References
<b>Pathogens</b>			
<i>Alternaria alternata</i> (Fr.:Fr.) Keissler (Fungi Imperfecti: Hyphomycetes)	CO,US	c,m,o,Zei	Farr <i>et al.</i> , 1989; Sharma and Khan, 1978; Tamayo-M, P.J. 1992.
<i>Alternaria solani</i> Sorauer (Fungi Imperfecti: Hyphomycetes)	CO,US	a,k,o	CMI, 1983; Farr <i>et al.</i> , 1989
<i>Alternaria</i> sp. (Fungi Imperfecti: Hyphomycetes)	CO	Z <sub>ti</sub>	Fischer <i>et al.</i> , 1990
<i>Cercospora diffusa</i> Ellis and Everth. (Fungi Imperfecti: Hyphomycetes)	Northern SA, US	a,o,v	Farr <i>et al.</i> , 1989
<i>Cercospora physalidis</i> Ellis (Fungi Imperfecti: Hyphomycetes)	SA,US	a,k,o,v	Farr <i>et al.</i> , 1989
<i>Cercospora</i> sp. (Fungi Imperfecti: Hyphomycetes)	CO	a	Fischer <i>et al.</i> , 1990
<i>Cladosporium cladosporioides</i> (Fresen.) G.A. De Vries (Fungi Imperfecti: Hyphomycetes)	CO,US	c,m,o,Z <sub>ti</sub>	Farr <i>et al.</i> , 1989; Lopez <i>et al.</i> , 1990
<i>Cladosporium oxysporum</i> Berk. & M.A. Curtis (Fungi Imperfecti: Hyphomycetes)	CO,US	o	Farr <i>et al.</i> , 1989; Tandon <i>et al.</i> , 1982
<i>Curvularia lunata</i> (Wakk.) Boedin var. <i>aeria</i> (Bastista, Lima & Vasconcelos) M.B. Ellis (Fungi Imperfecti: Hyphomycetes)	CO,US	m,o,Z <sub>ti</sub>	Cuarezma-Teran, 1985; Farr <i>et al.</i> 1989; Tandon and Singh, 1978
<i>Entyloma austale</i> Spegazzini (Basidiomycetes: Ustilaginales)	CO,US	a,o	Farr <i>et al.</i> , 1989; Mordue, 1988
<i>Exserohilum turcicum</i> (Pass.) K.J. Leonard & E.G. Suggs (Fungi Imperfecti: Hyphomycetes) Teleomorph: <i>Setosphaeria rostrata</i>	CO,US	m,o	Ceballos <i>et al.</i> , 1991; Farr <i>et al.</i> , 1989; Tandon and Singh, 1978
<i>Fusarium equiseti</i> (Corda) Sacc. (Fungi Imperfecti: Hyphomycetes)	Cosmopolitan	o,v,Z <sub>ti</sub>	Farr <i>et al.</i> , 1989; Rao and Subramoniam, 1976

<i>Penicillium italicum</i> Wehmer (Fungi Imperfecti: Hyphomycetes)	Widespread	c,o,v,z <sub>ti</sub>	Farr <i>et al.</i> , 1989
<i>Penicillium</i> sp. (Fungi Imperfecti: Hyphomycetes)	CO	z <sub>ti</sub>	Fischer <i>et al.</i> , 1990
<i>Phoma</i> sp. (Fungi Imperfecti: Hyphomycetes)	CO	z <sub>ti</sub>	Fischer <i>et al.</i> , 1990
<i>Rhizoctonia solani</i> Kuhn (Fungi Imperfecti: Agonomycetes) Teleomorph: <i>Thanatephorus cucumeris</i> (A.B. Frank) Donk	CO,US	a,m,o	Arbelaez, 1988; Farr <i>et al.</i> , 1989; Khatua and Maiti, 1975
<i>Sclerotium rolfsii</i> Sacc. (Fungi Imperfecti: Agonomycetes)	CO,US	a,m,o	Beebe, 1979; CMI 1992, Farr <i>et al.</i> , 1989
<i>Sphaerotheca fuliginea</i> (Schlechtend:Fr.) Pollaci (Pyrenomycetes: Erysiphales)	Cosmopolitan	o,v	Farr <i>et al.</i> , 1989;
<i>Stemphylium solani</i> G.F. Weber (Fungi Imperfecti: Hyphomycetes)	CO,US	a,k,o	CMI, 1979; Farr <i>et al.</i> , 1989
<b>Bacteria</b>			
<i>Agrobacterium tumefaciens</i> (Smith & Townsend) Conn	CO,US	c,o	Bradbury, 1986
<i>Pseudomonas solanacearum</i> (Smith) Smith	CO,US	c,o	Bradbury, 1986
<i>Pseudomonas syringa</i> pv. <i>tabaci</i> (Wolf & Foster) Young, Dye & Wilkie	CO,US	a,c,k,o	Bradbury, 1986
<i>Xanthomonas campestris</i> pv. <i>vesicatoria</i> (Doidge) Dye	CO,US	c,o,	Bradbury, 1986
<b>Viruses</b>			
Peru tomato virus	PE	a,d	Fribourg, 1979
Solanum apical leaf curling virus	PE	a,d	Hooker and Salazar, 1983
Tomato spotted wilt tospovirus	SA,US	d,o,v,z <sub>ti</sub>	Brunt <i>et al.</i> , 1990
<b>Arthropods</b>			
<i>Agrotis ipsilon</i> (Hufnagel) (Lepidoptera: Noctuidae)	CO,US	a,o	Gomez and Forero, 1989; Hill, 1987
<i>Ceratitis capitata</i> (Wiedemann) (Diptera: Tephritidae)	CO,US	z <sub>i</sub>	Cave, 1994; Liquido <i>et al.</i> , 1991;
<i>Diabrotica</i> spp. (Coleoptera: Chrysomelidae)	CO	a	Vargara, 1986
<i>Epitrix cucumeris</i> (Harris) (Coleoptera: Chrysomelidae)	CO,US	a,o	Fischer <i>et al.</i> , 1990; Smith <i>et al.</i> , 1992
<i>Gryllus assimilis</i> F. (Orthoptera: Gryllidae)	CO,US	a,c,o	Gomez and Forero, 1989
<i>Heliothis subflexus</i> Guenee (Lepidoptera: Noctuidae)	CO,US	a,o,z <sub>i</sub>	Gomez and Forero, 1989; Zhang, 1994
<i>Lineodes</i> sp. (Lepidoptera: Pyralidae)	CO	z <sub>i</sub>	Gomez and Forero, 1989
<i>Liriomyza huidobrensis</i> Blanchard (Diptera: Agromyzidae)	CO,CA,FL,TX, WA	a,h	Gary <i>et al.</i> , 1986; Gomez and Forero, 1989; Heinz and Chaney, 1995; Malais <i>et al.</i> , 1992; Seal and Baranowski, 1993; Vargara, 1986

<i>Liriomyza quadrata</i> Malloch (Diptera: Agromyzidae)	AR,BO,CL,CO,EC PE,VE	a	Briceno, 1971; Gomez and Forero, 1989; Spencer, 1973; Spencer, 1990; Squire, 1972
<i>Liomyza sativae</i> Blanchard (Diptera: Agromyzidae)	AR,BR,CL,CO, PE,VE,US	a,o	IIE, 1986; Spencer, 1973; Spencer, 1990
<i>Liriomyza solanita</i> Spencer (Diptera: Agromyzidae)	CO,VE	a	Gomez and Forero, 1989; Spencer, 1990
<i>Liriomyza trifolii</i> (Burgess) (Diptera: Agromyzidae)	BR,CO,GY,VE,US	a,o	CIE, 1984; Spencer, 1973; Spencer, 1990
<i>Macrosiphum euphorbiae</i> Thos. (Homoptera:Aphidae))	CO,US	a,o	CMI, 1984; Gomez and Forero, 1989
<i>Mesembreuxoz</i> sp. (Lepidoptera: Noctuidae)	CO	a	Gomez and Forero, 1989
<i>Myzus persicae</i> (Sulz.) (Homoptera: Aphidae)	AR,BO,BR,CL, CO,PE,SR,UY, VE,US	a,c,o,y	CIE, 1979; Singh <i>et al.</i> , 1975
<i>Nomophila colombiana</i> Monroe (Lepidoptera: Pyralidae)	CO	a	Gomez and Forero, 1989
<i>Phthorimaea operculella</i> (Zell.) (Lepidoptera: Gelechiidae)	CO,US	a,k,o	EEPO, 1995; Gomez and Forero, 1989; Kranz, 1977
<i>Scrobipalpula absoluta</i> Meyrick (Lepidoptera: Gelechiidae)	AR,BO,CL,CO, EC,PE,VE	k	Povolny, 1975
<i>Thrips palmi</i> Karny (Thysanoptera: Thripidae)	GY,VE,FL,GU, HI,PR	a,g,v	EPPO, 1995; Nakahara, 1994; Seal <i>et al.</i> , 1994; Sakimura <i>et al.</i> , 1986; Schreiner, 1991; Pantoja <i>et al.</i> , 1988
<i>Trialeurodes vaporariorum</i> Westw. (Homoptera: Aleyrodidae)	CO,US	a	Gomez and Forero, 1989; Metcalf and Metcalf, 1993

<sup>1</sup> Distribution legend: AR = Argentina; BO = Bolivia, BR = Brazil; CL = Chile, CO = Colombia; EC = Ecuador; GY = Guyana; PE = Peru; SR = Suriname, UY = Uruguay, VE = Venezuela; SA = South America; US = United States; CA = California; FL = Florida; WA = Washington; TX = Texas

- <sup>2</sup> Comments:
- a = Pest mainly associated with a plant part other than the commodity.
  - c = Listed in non-reportable dictionary as non-actionable.
  - d = Commodity is unlikely to serve as inoculum source because vector is unknown or does not feed on commodity and/or seed transmission has not been reported.
  - g = Quarantine pest: pest has limited distribution in the U.S. and is under official control as follows: pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity.
  - h = Quarantine pest: pest has limited distribution in the U.S. and is under official control as follows: (1) pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity and, (2) pest is a program pest.
  - k = Not specifically listed for host, but reported from other hosts in same plant genus/family.
  - m = The pest occurs within the PRA area and has been reported to attack the specified host species in other geographic regions; but has not been reported to attack the specified host species in the PRA area.
  - o = Organism does not meet the geographical and regulatory definition for a quarantine pests.
  - v = No specific reports of the pest from PRA area, but regional report exist and the pest may be present in the PRA area.
  - y = Pest is a vector of plant pathogens.
  - z<sub>e</sub> = External pest: is known to attack or infest *Physalis* spp. fruits and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.
  - z<sub>i</sub> = Internal pest: is known to attack or infest *Physalis* spp. and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

<sup>3</sup>*Ceratitis capitata* has been detected on occasion in the United States. Whenever *C. capitata* has been detected, a quarantine was established and an eradication program was implemented. *C. capitata* is considered a quarantine pest in the United States.

## 5. List of Quarantine Pests

The list of quarantine pests for shipments of Cape Gooseberry from Colombia is provided in Table 3. Should any of these pests be intercepted on shipments of *Physalis peruviana*, quarantine action may be taken.

Table 3: Quarantine Pests: Cape Gooseberry fruits consumption	
<b>Pathogens</b>	<i>Alternaria</i> sp. <i>Cercospora</i> sp. <i>Phoma</i> sp.
<b>Arthropods</b>	<i>Ceratitis capitata</i> . <i>Diabrotica</i> sp. <i>Lineodes</i> sp. <i>Liriomyza huidobrensis</i> <i>Liriomyza quadrata</i> <i>Liriomyza solanita</i> <i>Thrips palmi</i>

## 6. Quarantine Pests Likely to Follow Pathway (i.e., Quarantine Pests Selected for Further Analysis)

Only those quarantine pests that can reasonably be expected to follow the pathway, *i. e.*, be included in commercial shipments of *Physalis peruviana* were analyzed in detail (see USDA, 1995). Only quarantine pests listed in Table 4 were selected for further analysis and subjected to steps 7-9 below.

Table 4: Quarantine Pest, Likely to Follow Pathway: Colombia Cape Gooseberry Fruits for Consumption	
<b>Arthropods</b>	<i>Ceratitis capitata</i>

Other plant pests in this Assessment, not chosen for further scrutiny, may be potentially detrimental to the agricultural production systems of the United States; however, there were a variety of reasons for not subjecting them to further analysis. For example, they are associated mainly with plant parts other than the commodity; they may be associated with the commodity (however, it was not considered reasonable to expect these pests to remain with the commodity during processing); they have been intercepted as biological contaminants, by Plant Protection and Quarantine Officers, during inspections of these commodities but would not be expected to move with every shipment. In addition, the biological hazard of organisms identified only to the generic level are not assessed due to the lack of adequate biological/taxonomic information. This lack of biological information on any given insect or pathogen should not be equated with low risk. By necessity, pest risk assessments focus on those organisms for which biological information is available. By developing detailed assessments for known pests that inhabit a variety of niches on the parent species, *i.e.* on the surface of or within the bark/wood, on the foliage, etc., effective mitigation measures can be developed to eliminate the known organisms and any similar unknown ones that inhabit the same niches.

## 7. Economic Importance: Consequences of Introduction

The consequences of introduction was considered for each quarantine pest selected for further analysis. For qualitative, pathway-initiated pest risk assessments, these risks were estimated by rating each pest with respect to five risk elements. A full description of these elements and rating criteria can be found in USDA (1995). Table 5 presents the risk ratings for these risk elements.

Table 5: Risk Rating: Consequences of Introduction						
Pest	Climate/ Host	Host Range	Dispersal	Economic	Environ- mental	Risk Rating
<i>Ceratitis capitata</i>	high	high	high	high	high	high

## 8. Likelihood of Introduction

Each pest is rated with respect to introduction potential, *i.e.*, entry and establishment. Two separate components are considered. First, the amount of commodity likely to be imported is estimated. More imports lead to greater risk; the result is a risk rating that applies to the commodity and country in question and is the same for all quarantine pests considered. Second, five biological features, *i.e.*, risk elements, concerning the pest and its interactions with the commodity are considered. The resulting risk ratings were specific to each pest. The cumulative risk rating for introduction was considered to be an indicator of the likelihood that a particular pest would be introduced. A full description of these elements and rating criteria can be found in USDA (1995). Table 6 presents the ratings for these risk elements.

Table 6: Risk Rating: Likelihood of Introduction							
Pest	Quantity of commodity imported annually	Likelihood survive postharvest treatment	Likelihood survive shipment	Likelihood not detected at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk rating
<i>Ceratitis capitata</i>	medium	high	high	high	high	high	high

## 9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The measure of pest risk potential (PRP) combines the risk ratings for consequences and likelihood of introduction as described in USDA (1995). The estimated pest risk potential for each quarantine pests selected for further analysis for importation of Colombia *Physalis peruviana* fruits is provided in Table 7.

Table 7: Pest Risk Potential, Quarantine Pests,	
Pest	Pest risk potential
<i>Ceratitis capitata</i>	high

Plant pests with a high Pest Risk Potential may require specific phytosanitary measures. The choice of appropriate sanitary and phytosanitary measures to mitigate risk is undertaken as part of Risk Management, and is not addressed, *per se*, in this document.

PPQ has intercepted 170 pests with *Physalis* spp. from other areas. Some of these same pests may occur in Colombia in addition to other quarantine pests and have been intercepted as hitchhikers with other commodities. Should additional pests, not identified in this Risk Assessment, be intercepted on commercial (or any other) shipments of cape gooseberry from Colombia, appropriate quarantine action may be taken.

## C. References

- Arbelaez, G. 1988. Fungal and bacterial diseases on carnation in Colombia. *Acta Horticulture* #216, p. 151-157.
- Bailey, L. H. 1949. *Manual of Cultivated Plants*. MacMillan Publishing Company, N. Y. 1116 pp.
- Beebe, S. 1979. Root rots. Centro Internacional de Agricultura Trop., Cali, Colombia. 7 pp.
- Bradbury, J. F. 1986. *Guide to Plant Pathogenic Bacteria*. CAB International Mycological Institute, Surrey, England. 332 pp.
- Briceno, V. A. 1971. Potato leaf miner *Liriomyza quadrata* Malloch (Diptera, Agromyzidae) in the Venezuelan Andes region. *Agron. Trop.* Maracay 21:341-343.
- Brunt, A., K. Crabtree, and A. Gibbs. 1990. *Viruses of Tropical Plants*. CAB International, Oxon, UK. 707 pp.
- Cave, G. L. 1994. Pest Data Sheet, *Ceratitis capitata*, Mediterranean Fruit Fly. Unpublished document, APHIS, USDA. 3 pp.
- Ceballos, H., J. A. Deutsch, and H. Gutierrez. 1991. Recurrent selection for resistance to *Exserohilum turcicum* in eight subtropical maize populations. *Crop Sci.* Madison, Wis. 31:964-971.
- CIE. 1979. Distribution Maps of Pests. Number 45, *Myzus persicae*. Commonwealth Agricultural Bureaux, UK.
- CIE. 1984. Distribution Maps of Pests. Number 450, *Liriomyza trifolii*. Commonwealth Agricultural Bureaux, UK.
- CMI. 1979. Distribution Maps of Pests. Number 333, *Stemphylium solani*. Commonwealth Agricultural Bureaux, UK.
- CMI. 1983. Distribution Maps of Pests. Number 89, *Alternaria solani*. Commonwealth Agricultural Bureaux, UK.

- CMI. 1984. Distribution Maps of Pests. Number 44, *Macrosiphum euforbiae*. Commonwealth Agricultural Bureaux, UK.
- CMI. 1992. Distribution Maps of Pests. Number 311, *Corticium rolfsii*. Commonwealth Agricultural Bureaux, UK.
- Cuarezma-Teran, J. A. 1985. Nematodes and fungi associate with a sorghum root disease complex. Dissertation, Mississippi State Univ.
- EPPO. 1995. European and Mediterranean Plant Protection Organization Reporting Service No. 6, Paris, France. 24 pp.
- FAO. 1996. International Standards for Phytosanitary Measures. Part 1 - Import Regulations: Guidelines for Pest Risk Analysis (Draft Standard). Secretariate of the International Plant Protection Convention of the Food and Agriculture Organization of the United Nations. Rome, Italy. 21 pp
- Farr, D. F., G. F. Bills, G. P. Chamuris, and A. Y. Rossman. 1989. Fungi on Plants and Plant Products in the United States. American Phytopathological Society, St. Paul, MN. 1252 pp.
- Fischer, G., M. Buitrago, and P. Luedders. 1990. *Physalis peruviana* L. - cultivation and investigation in Columbia. Erwerbsobstbau 32:229-232.
- Fribourg, E.E. 1979. Host plant reactions, some properties, and serology of Peru tomato virus. Phytopathology 69:441-445.
- Gary, W. J., D. F. Mayer, and A. L. Antonelli. 1986. Insects answers: Pea leafminer. Extension bull. Wash. State Univ., Pullman, Wash. 2 p.
- Gomez, M. A. and V. H. Forero. 1989. Reconocimiento e identificacion de entomofauna en el cultivo de la uchuva *Physalis peruviana* L. En Boyaca. Thesis, Univ. Pedagogica y Tecnologica de Colombia. 100 pp.
- Gunn, C. R. and C. Ritchie. 1982. 1982 Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act. (unpublished).
- Heinz, K. M. and W. E. Chaney. 1995. Sampling for *Liriomyza huidobrensis* (Diptera: Agromyzidae) larvae and damage in celery. Environ. Entomol. 24:204-211.
- Holm, L. G., D. L. Plucknett, J. V. Pancho and J. P. Herberger. 1977. The World's Worst Weeds. University of Hawaii Press, Honolulu. 609 pp.
- Holm, L. G., J. V. Pancho, J. P. Herberger and D. L. Plucknett. 1979. A Geographical Atlas of World Weeds. John Wiley and Sons, New York. 392 pp.
- Hooker, W. J. and L. F. Salazar. 1983. A new plant virus from the high jungle of the Easter Andes Solanum. Ann. Appl. Biol. 103:449-454.
- Hopper, B. E. 1996. NAPPO Compendium of Phytosanitary Terms. NAPPO Doc. No. 96-027. North American Plant Protection Organization (NAPPO). NAPPO Secretariate, Ottawa, Ontario, Canada. 25 pp.
- IIE. 1986. Distribution Maps of Pests. Number 477, *Liriomyza sativae* Blanchard. Commonwealth Agricultural Bureaux, UK.
- Khatua, D. and S. Maiti. 1975. India Sci Cong Assoc Proc 62. Conference paper.
- Kranz, J. H. Schmutterer, and W. Koch. 1977. Diseases, Pests and Weeds in Tropical Crops. John Wiley & Sons, NY. 666 pp.
- Liquido, N. J., L. A. Shinoda, and R. T. Cunningham. 1991. Host Plants of the Mediterranean Fruit Fly Diptera Tephritidae. An Annotated World Review. Ent. Soc. Am. Misc. Publ. 77. 52 pp.
- Lopez, S. E., M. D. Bertoni, and D. Cabral. 1990. Fungal decay in creosote-treated *Eucalyptus* power transmission poles. I. Survey of the flora. Material und Organismen 25:287-293.
- Malais, M., J. P. Newman, J. La-Salle, and M. P. Parrella. 1992. Leafminers and associated parasites in *Gypsophila*. Flower Nursery Rep. Commer. Grow. Univ. Berkley, Calif. 24:1-4.
- Metcalf, R. L. and R. A. Metcalf. 1993. Destructive and Useful Insects: Their Habits and Control. McGraw-Hill, NY.

- Mordue, J. E. M. 1988. CMI Descriptions of Pathogenic Fungi and Bacteria, No. 961. *Entyloma australe*. CAB International, Surrey, England. 2 pp.
- Nakahara, S. 1994. The Genus Thrips Linnaeus (Thysanoptera: Thripidae) of the New World. USDA, ARS. Technical Bulletin Number 1822. 182 pp.
- Pantoja, A., A. Segarra, H. Ruiz, and S. Medina-Gaud. 1988. *Thrips palmi* (Thysanoptera: Thripidae): a new insect pest for Puerto Rico. J. Agric. Univ. Puerto Rico 172:327.
- Povolny, D. 1975. On three neotropical species of Ignorimoschemini mining Solanaceae. Acta Univ Agric Brno 23:379-393.
- Rao, V. G. and V. Subramoniam. 1976. A new post-harvest diseases of cape-gooseberry. Journal of the Univ. Of Bombay, Science 45:58-61.
- Reed, C.F. 1977. Economically Important Foreign Weeds. Agriculture Handbook No. 498. 746 pp.
- Sakimura, K., L. M. Nakahara, and H. A. Denmark. 1986. A thrips, *Thrips palmi* Karny (Thysanoptera: Thripidae). Entomol. Circular #280, Div. Plant Ind., Florida Dept. Agric. and Con. Ser. 4 pp.
- Schreiner, I. H. Damage Threshold for *Diaphania indica* Saunders (Lepidoptera: Pyralidae) on cucumbers in Guam. Trop. Pest Management 37:17-20.
- Seal, D. R. and R. M. Baranowski. 1994. Effectiveness of insecticides in controlling *Thrips palmi* Karny (Thysanoptera: Thripidae) on different vegetable crops in south Florida.. Proc. Annual Meeting Fl. State Hort. Soc. 106:228-233.
- Sharma, N. and A. M. Khan. Fruit rots of cape gooseberry. Indian Phytopathology 31:513-514.
- Singh, S. J., K. S. M. Sastry, and K. S. Sastry. 1975. Investigations on a mosaic disease of Cape gooseberry. Current Science 44:95-96.
- Smith, I. M., D. G. McNamara, P. R. Scott, and K. M. Harris. 1992. Quarantine Pests for Europe. Data sheets on quarantine pests for the European Communities and for the European and Mediterranean Plant Protection Organization. CAB International, Wallingford, UK. 1032 pp.
- Spencer, K. A. 1973. Agromyzidae (Diptera) of Economic Importance. W. Junk B.V. Pub. The Hague. 418 pp.
- Spencer, K. A. 1990. Host Specialization in the World Agromyzidae (Diptera). Kluwer Academic Pub. London, UK. 444 pp.
- Squire, F. A. 1972. Entomological problems in Bolivia. PANS 18:254-256.
- Tamayo-M, J. J. 1992. Black pod disease of bean caused by *Alternaria alternata*. ASCOLFI-Informa. 18:38-39.
- Tandon, M. P. N. and N. Singh. 1978. New fruit rot diseases of cape gooseberry. Proc. Of the Nat. Academy of Sciences, India 48:169-170.
- Tandon, M. P. N. Singh, and D. N. Shukla. 1982. Influences of sulphur sources on the growth and sporulation of *Alternaria tenuissima* (Kunze ex Pers.) Wiltshire, *Myrothecium carmichaelii* Greville, *Drechsler rostrata* (Drechsler) Richardson and Fraser and *Cladosporium oxysporum* Berk. And Curt. Proc. Of the Nat. Academy of Sciences, India. 52:42-48.
- USDA. 1995. Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, Ver 4.0. PPQ, APHIS. 15 pp.
- Vargara, R. 1986. Insectos Plagas del Cultivo de la Uchuva *Physalis peruviana* L. Memorias 1, Curso Nacional de Uchuva, Tunja, Colombia, p. 16-30.
- WSSA, 1989. Composite List of Weeds. Weed Science Society of America.
- Zhang, Bin-Chang. 1994. Index of Economic Important Lepidoptera (Electronic Version).

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